



Progress on installation and the run plan

Stepan Stepanyan
JLAB

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HPS 2019 run

- ❑ CEB AF beam restoration starts on June 10
- ❑ Officially beam to physics I planned for June 17
- ❑ We should be ready for the beam around June 14, Friday, early start is possible especially for the beam tune purposes
- ❑ Should have HCO completed and Hall ready for beam by June 10 or 11
- ❑ Currently we plan to man the counting room and have experts on call available starting from June 13
- ❑ The run page and the run-wiki with updated documentation (COO, ESAD, RSAD) should be restored by June 7 in order to get the run certificate
- ❑ Run is 9 weeks on the floor



Beam parameters

Parameter	Value
Beam energy (5 pass)	4.55 GeV
Beam current	up to 450 nA
Current stability	< 10%
Beam bunch Frequency	499 MHz
Beam profile at the target	
σ_x	< 100 μm
σ_y	< 50 μm
Halo	< 10^{-5} @ 5 σ
Beam position stability	
in x	< 50 μm
in y	< 50 μm



CLAS12-HPS transition, started 04/16

- ❑ Remove beamline elements from the space frame, disconnect and remove CLAS12 cryo target, move the target to EEL: 4/16 – 4/19
- ❑ Remove shielding on the tagger, remove the collimator box, replace beam pipe through the tagger magnet yoke: 4/16 – 4/26
- ❑ Restore shielding and reinstall collimator box: 4/29 – 5/3
- ❑ Restore beamline on the space frame: 4/29 – 5/3
- ❑ Move solenoid upstream and install beam pipe through torus bore: 4/29 – 5/3
- ❑ Start pump down vacuum in upstream beam line (including tagger magnet vacuum chamber): 5/3
- ❑ Install He-bag and beam viewer on tagger dump: 5/6 – 5/10
- ❑ Restore downstream chicane magnet and the vacuum chamber: 4/22 – 4/26
- ❑ Move HPS analyzing magnet to its nominal position: 4/22 – 4/26
- ❑ Restore HPS halo counters: 5/1 – 5/3



HPS detector installation

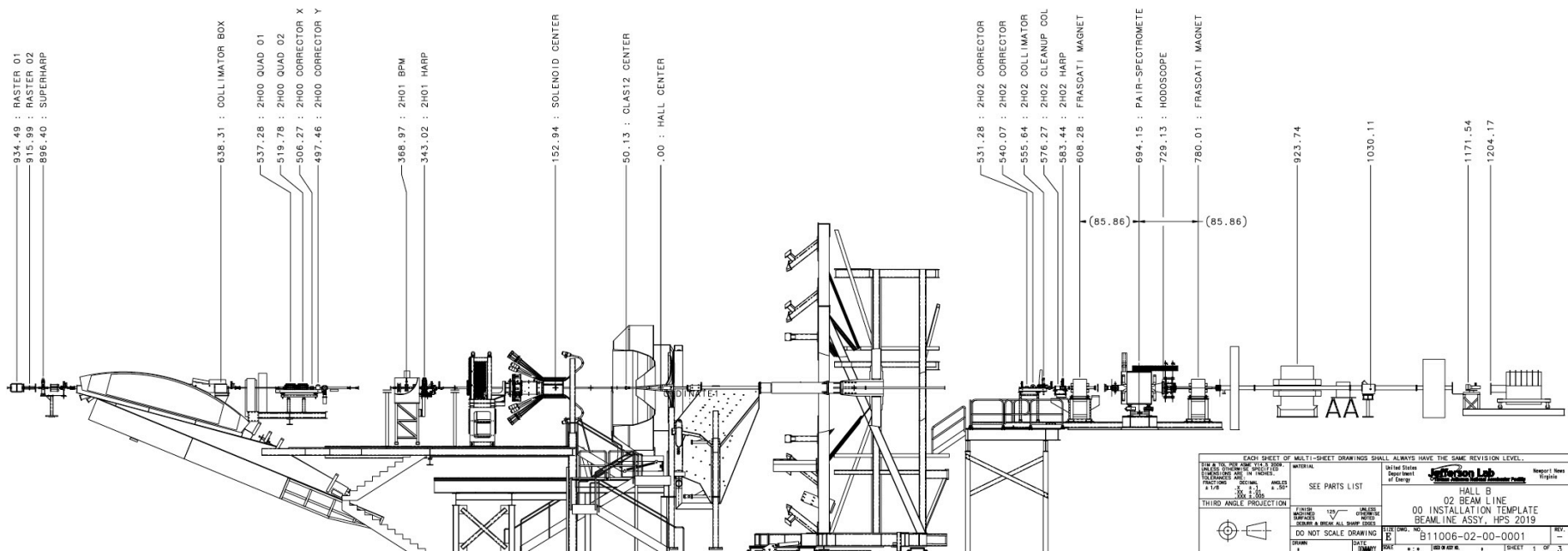
- ❑ Open the vacuum chamber, install and survey SVT L6: 5/06 – 5/10
- ❑ Install and **survey** the hodoscope, install Ecal and downstream Frascati vacuum chambers: 5/9 – 05/10
- ❑ Move Ecal towards the magnet, connect to the electronics, install the hodoscope PMTs and start cosmic calibrations: 4/29
- ❑ Install and survey SVT L0-3 and the target: 5/06 – 5/10
- ❑ Connect and tests SVT cooling, and the SVT and target motion systems, close the vacuum chamber: 5/9 – 5/10
- ❑ Install and connect upstream Frascati dipole: 5/13 – 5/14
- ❑ Test magnets: 5/14
- ❑ Install 2H02A harp, cleanup collimator, 2H02 girder with HPS collimator, and connect to vacuum chamber: 5/13 – 5/15
- ❑ Test the vacuum downstream of the 2H02 girder: 5/15 – 5/17
- ❑ Install beam pipes from forward carriage to the alcove: 5/20
- ❑ Move Ecal to the running position and survey the “world”: 5/20 – 5/22



HPS beamline

Few things are different from 2015/2016 runs:

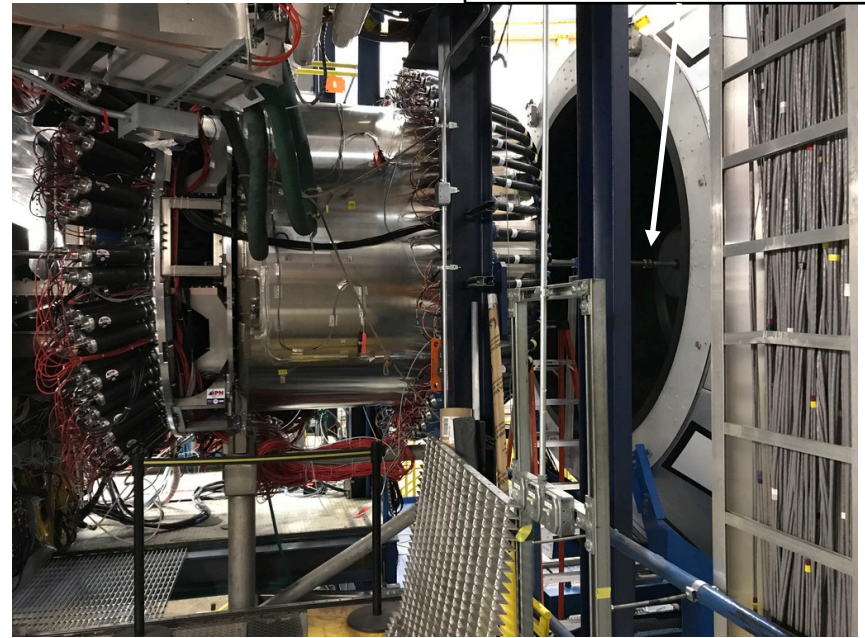
- A beampipe through the tagger dipole, will improve the vacuum for straight through beam. Beam pipe has a thin ($40\ \mu\text{m}$) window for beam to go to tagger dump
- More shielding after the collimator and through the torus bore
- Two harps, 2H01A and 2H02A, no magnetic elements in between. The distance between two harps is 10x larger than distance between 2H02A and the HPS target



Upstream Beamline



Vacuum connection



- Survey/alignment is done for the upstream beamline, the beamline up to exit of the forward carriage is ready.
- Some work has to be done to improve the vacuum in the tagger vacuum chamber.

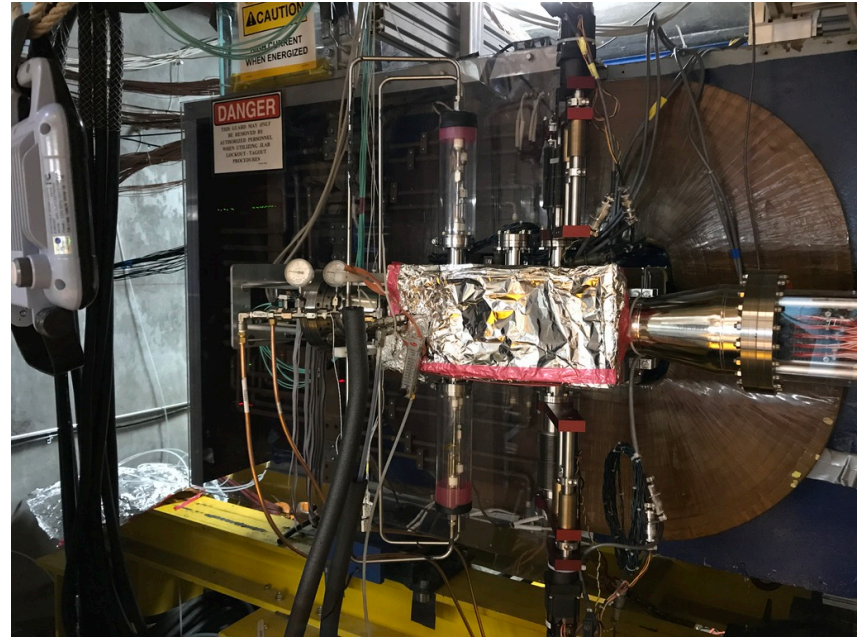


Installation of SVT

SVT is IN!



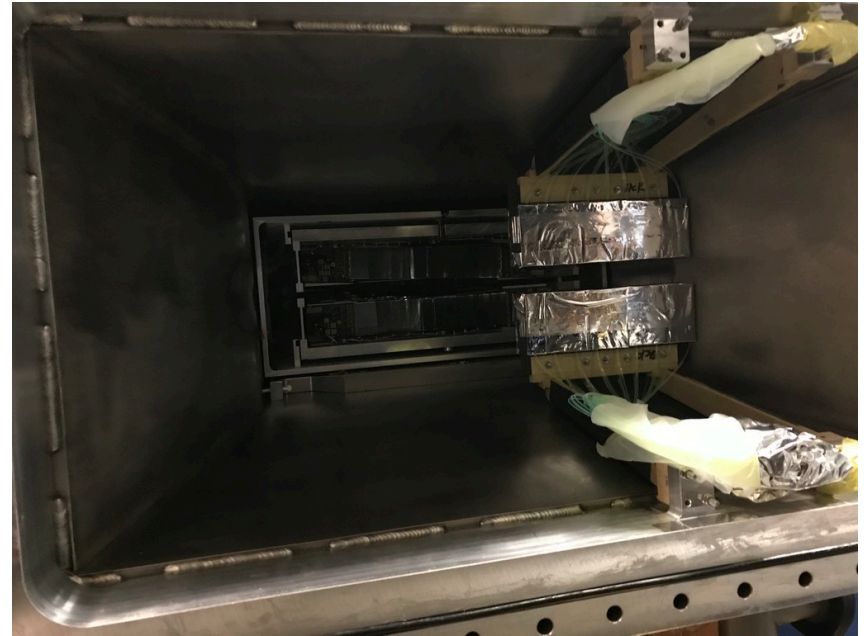
Cooling lines are connected



Survey and alignment is done, test of DAQ is in progress. Installation of the target will follow, then closing the vacuum (*details in Tim's and Cameron talks*).



Installation of the Hodoscope



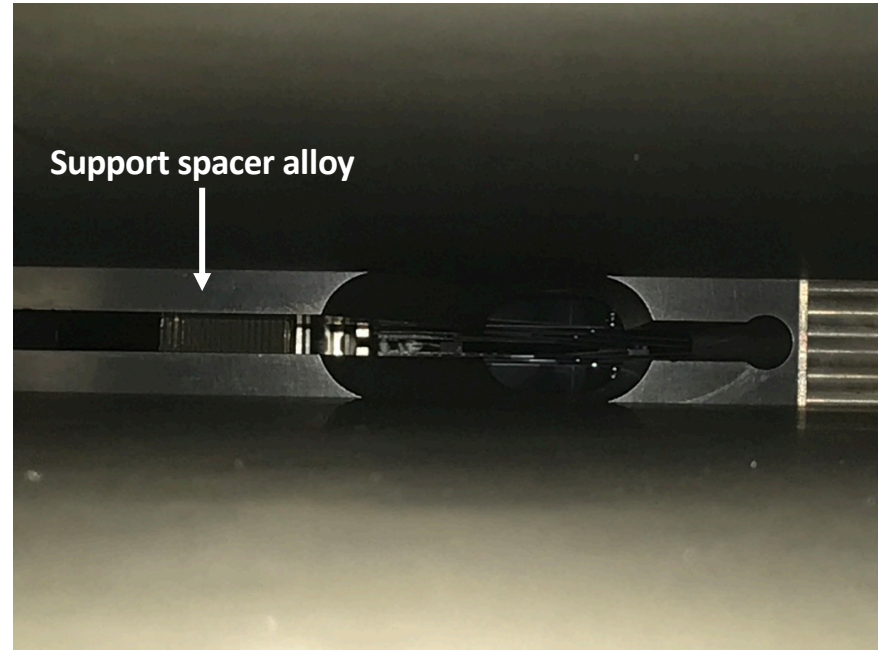
Hodoscope was fiducialized relative to the flange in the lab. Flange will be surveyed after everything is installed (*details in Rafo's talk*)



Ecal and vacuum chamber installation

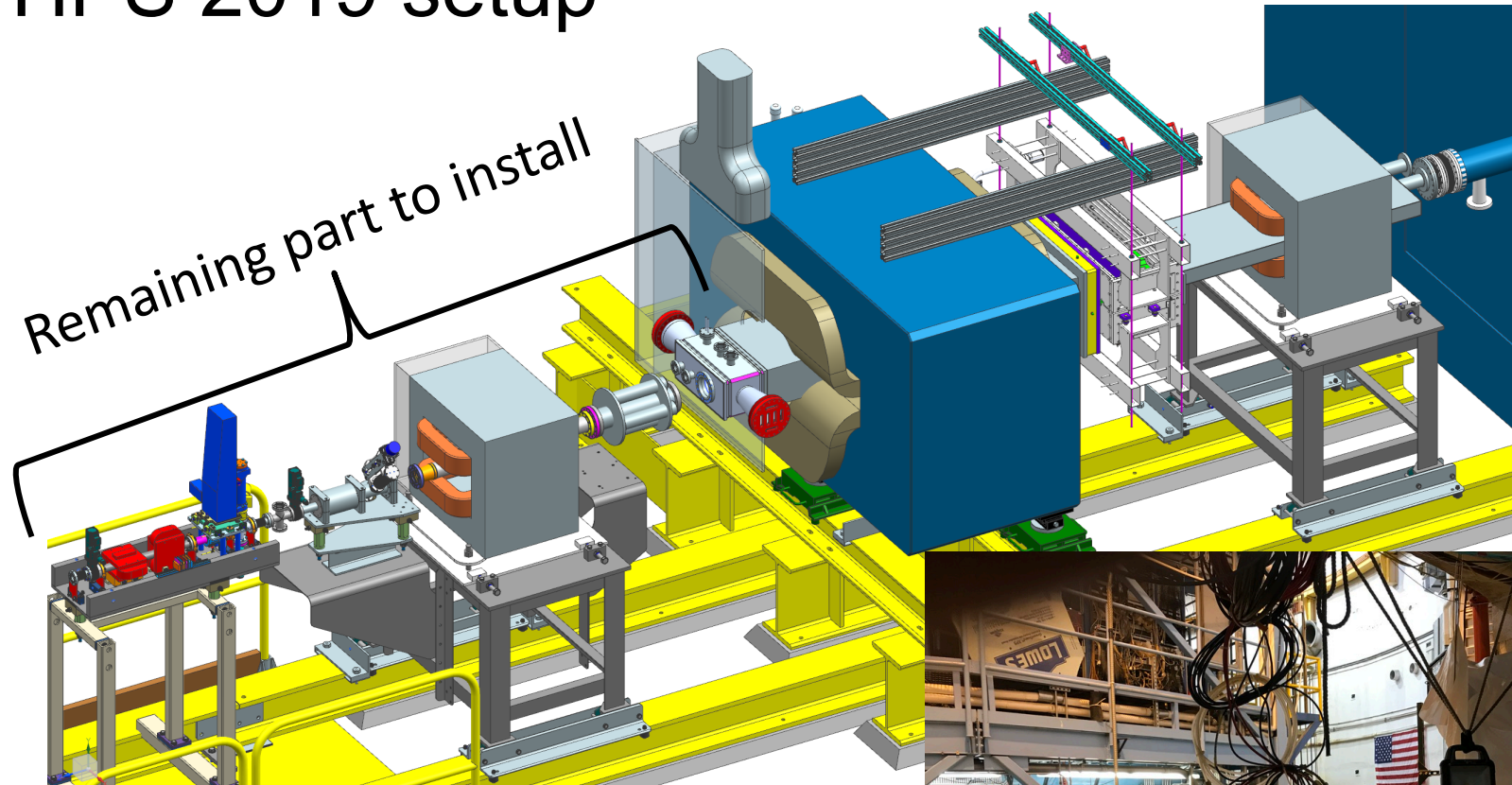


↑ Ecal vacuum chamber flange
↑ Hodoscope flange
↑ SVT vacuum chamber flange

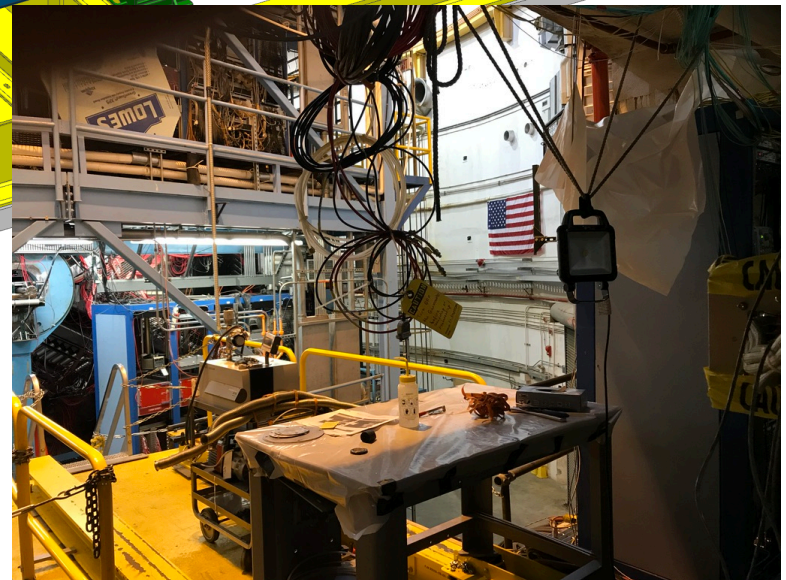


Ecal is in the correct z-position, will be moved close to the vacuum chamber when everything is ready for final survey (*details in Nathan's talk*).

HPS 2019 setup



- Support stand for 2H02 girder is ready
- New harp and the stand are ready
- Magnet is in the hall



Summary of installation

- Detectors are installed, ECal and hodoscope have been commissioned with cosmics
- Upstream beamline is almost ready, can benefit from improvement of the vacuum in the tagger vacuum chamber and around the collimator box
- Remaining beamline installation is about one work week effort, including the final survey
- Will need a day or so for exercising EPICS controls
- It is tight but HPS can be ready for beam early in week of June 10, unless some unexpected will happen, e.g.:
 - delay in the closing of the vacuum chamber due to SVT DAQ work
 - chicane magnets or magnet power supplies will not come up
 - issues with the vacuum in the HPS vacuum chambers



Starting the Run (preliminary)

- ❑ Beam tune, establishing physics quality beam for HPS – procedures must be updated
 - beam to the Hall-B tagger dump will stay the same
 - procedures for setting up beam through HPS must be revised (e.g. position of SVT, chicane, position of the protection collimator)
- ❑ Calibrate beamline devices (nA BPMs, stripline BPMs, orbit locks) – will be done by MCC ops
- ❑ Use wire harps at 2H00 and 2H02 to minimize beam size at the HPS target location
- ❑ Turn ON the chicane, must calculate currents (simple) and validate the settings (rates in ECal crystals around the Ecal hole)
- ❑ Turn ON Ecal, and hodoscope
- ❑ ECal and hodoscope rate studies with 0.125% r.l. W-target and 50 nA – 100 nA beam current



Align beam to HPS and rate studies

- ❑ Setup beam trajectory (vertical position) through HPS using the SVT wires.
- ❑ Align SVT collimator on the beam, which slot – 3.94 mm, 2.25 mm and 2.52 mm
- ❑ Setup orbit locks and FSD threshold
 - do we need to test SD system?
- ❑ DAQ and trigger studies, timing of detectors
- ❑ Turn on SVT, occupancy studies at low beam current, 50 nA? - *need a plan, do we just move SVT in, is software ready to get occupancies on-line*
- ❑ Study beam tails (*need a plan*) and beam position stability
- ❑ Trigger validation runs (*need a plan and a list of triggers*)
- ❑ Luminosity scan to define the beam current for the production running



Production running (preliminary)

- Production data taking at ~ 400 nA with 0.125% r.l. W target, 4 hour long runs
- Low luminosity runs with 50 nA beam for data quality validation, 2x4 hour runs weekly
- Random trigger runs to collect beam background events and for the trigger/detector efficiency studies, 2 hour runs biweekly
- NO target (empty target) runs to check beam tails, short 0.5 hour data taking weekly
- “straight through” (chicane off) runs, weekly or biweekly?
- ~~Runs with calibration targets (foil displaced in z or wire?). Weekly~~
- Low energy run for Mollers – if we need we can plan to run last few days with either 2 pass (1.9 GeV) or 3 pass (2.7 GeV) beams



Summary

- ❑ Things are progressing reasonably well in the installation of the beamline and detectors
- ❑ Integration of DAQs (JLAB+SLAC) is on the critical path for getting ready for the run
- ❑ Should be decided soon on the details of the run plan, frequency of the special runs as well as need for running with a low energy beam for the SVT calibration using Moller scattering
- ❑ Procedures and manuals must be updated. Some of operational procedures will be decided during the run as they depend on the beam quality, e.g.
 - Will we retract SVT on every beam trip (2015) or only when beam trip is due to us, our FSD (2016)

